# 4D Data Reanalysis/Assimilation with Satellite, Radar and the Extensive Field Measurements

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## Introduction

- To produce a high-resolution 4D assimilated data set that is consistent with the dynamical and thermodynamical processes of the atmosphere.
- To provide more realistic meteorological conditions in supporting extensive modeling and validation studies.
- To provide "a continuous movie of the atmosphere" for characterizing cirrus cloud systems in dynamics and microphysics, and their roles in both regional and global weather/climate.
- The Advanced Regional Prediction System (ARPS) and its data analysis/assimilation system are used for the real-time supporting forecasts (see the website: http://asd-www.larc.nasa.gov/model/crystal) and for this 4D data reanalysis/assimilation.

## Data

- Surface observations: Hourly METARs, including the cloud reports
- Upper-level soundings: NWS/PARSL/Mible radiosondes and Dropsondes
- Satellite observations: GOES-8 IR and visible imagery data
- Radar data: WSR-88D (NEXRAD) Level II reflectivity

## 3D Multi-Radar Reflectivity Mosaic

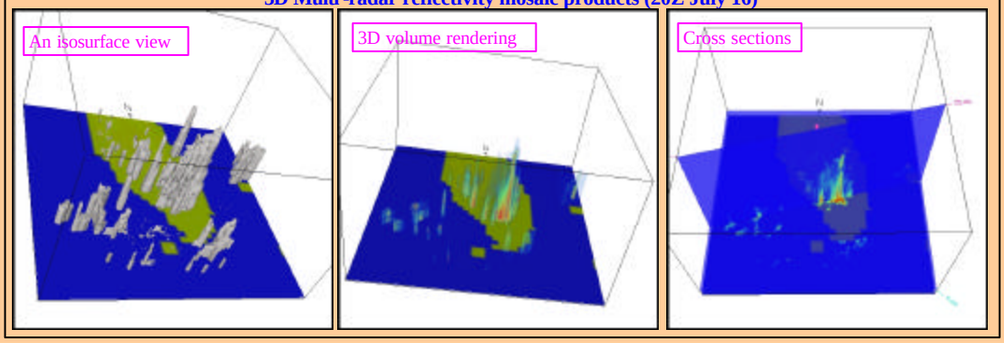
### Motivation

- Reflectivity mosaics provide more complete depictions of convective storm structure than products from single radars.
- The mosaic gridded data can be more easily combined with information from additional data sources (e.g., satellite, model analyses and forecast fields).

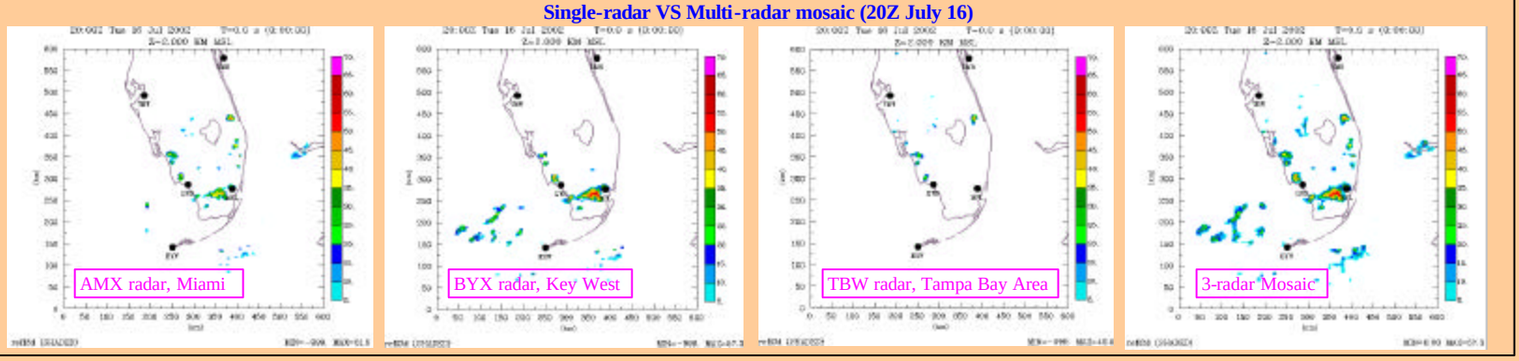
### Multi-radar mosaic methodology

- Multiple radar observations are blended using a weighted average scheme.
- The weight given to a radar observation is dependant on the distance between the radar and the observation.

**3D Multi-radar reflectivity mosaic products (20Z July 16)**



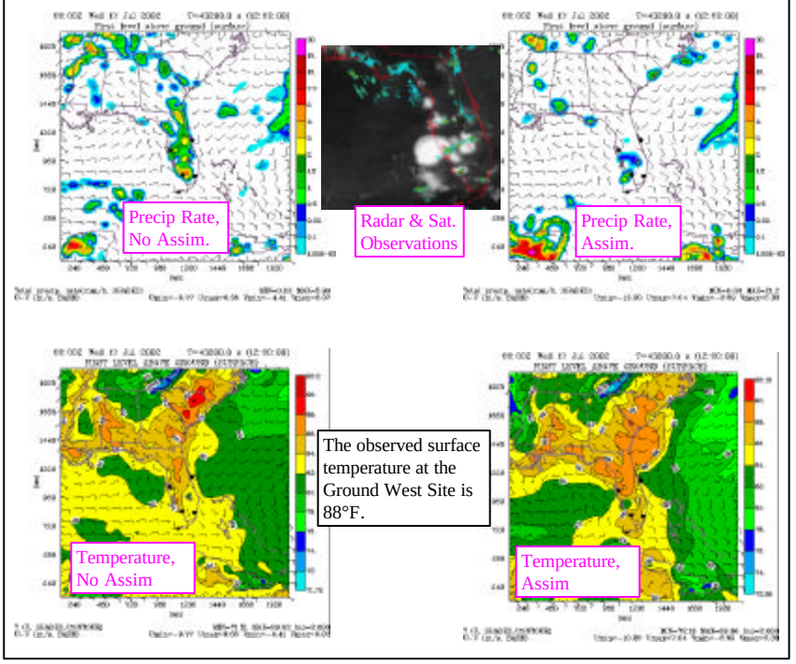

**Single-radar VS Multi-radar mosaic (20Z July 16)**




## 4D Data Assimilation – Hourly Continuous Assimilation Cycling

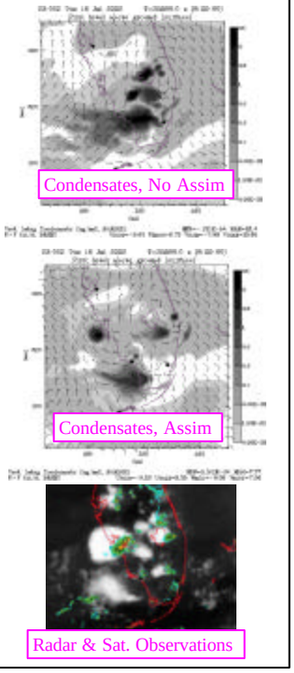
**(A sample case of July 16, assimilated from 15Z to 24Z on both 15-km and 3-km grid)**

**15-km Grid, valid at 00Z July 17**




The observed surface temperature at the Ground West Site is 88°F.

**3-km Grid, valid at 23Z**




## Future Work

- To make use of satellite-derived cloud properties, to provide more detailed cloud information for data assimilation.
- To attempt 1-km resolution with more frequently assimilation-cycling (30 min or 15 min).
- To validate the assimilation data with the extensive experiment measurements.
- To conduct the cloud-radiation interaction physics for the assimilation system, to produce the radiative properties.

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